$$x/a+y/b+c/z=P....(1),$$
$$x/a+b/y+z/z=Q....(2),$$
$$a/x+y/b+z/z=R....(3).$$

Solution by the PROPOSER.

Let $x/a=u$, $y/b=v$, $z/c=w$.

$u+v+1/w=P....(1)$, $u+1/v+w=Q....(2)$, $1/u+v+w=R....(3)$.

$(1)-(2)$ gives $v^2 \mathrm{w}+v-vw^2-Pvw+Qvw=w....(4)$.

$(1)\times(3)$ gives $1=(P-v-1/w)(R-v-w)$, or

$$v^2w+v+vw^2-Pvw-Rvw=Pw^2-PRw+R....(5).$$

$$(5)-(4) \text{ gives } vw=\frac{(w-R)(Pw-1)}{2w-R-Q}....(6).$$

$$(5)\div(4) \text{ gives} \frac{vw+1+w^2-Pw-Rw}{vw+1-w^2-Pw+Qw}=\frac{Pw^2-PRw+R}{w}....(7).$$

(6) in (7) gives

$$\frac{2w^3-(P+Q+3R)w^2+(1+R^2+PQ+RQ)w-Q}{-2w^3+(R-P+3Q)w^2+(1-Q^2+PQ-RQ)w-Q}=\frac{Pw^2-PRw+R}{w}$$

$\therefore$ $2Pw^5+(2-3PR-3PQ+P^2)w^4+(4PQR+PR^2-P^2R+PQ^2-P^2Q-2P-Q-R)w^3+(1+2PQ-2QR+2PR-PQ^2R+P^2QR-PR^2Q)w^2+(RQ^2+R^2Q-R-Q-2PQR)w+RQ=0$.

This is an equation of the 5th degree and I have thus far been unable to solve it.

Let $P=Q=R$. Then

$$2Pw^5+(2-5P^2)w^4+4P(P^2-1)w^3+(1+2P^2-P^4)w^2-2Pw+P^2=0.$$

Let $P=3$.

$\therefore w^5-\frac{43}{6}w^4+16w^3-\frac{31}{3}w^2-w+\frac{3}{2}=0$, or $(w-\frac{1}{2})(w-1)(\mathrm{w}-3)(\mathrm{w}-3)(\mathrm{w}-\frac{1}{3})=0$.

$\therefore$ $\mathrm{w}=\frac{1}{2}, 1, 3, 3$ or $-\frac{1}{3}$; $v=\frac{1}{2}, 1, 3, -\frac{1}{3}$ or 3; $u=\frac{1}{2}, 1, -\frac{1}{3}, 3$ or 3.

GEOMETRY.

176. Proposed by R. A. WELLS, Franklin College, New Athens, Ohio.

If there be three straight lines which meet in a point, and the arbitrary constants of their equations, expressed in the slope form, be taken as the co-ordinates of three points, these three points will lie in a straight line.

Solution by ANNA L. VAN BEUSCHOTEN, Professor of Mathematics, Wells College, Aurora, N. Y.

Let the three straight lines be given by the equation

$$y=ax+b,\ y=cx+d,\ y=ex+f.$$

The condition that these lines intersect in a common point is given by the vanishing of the determinant,

$$\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix}$$

But the vanishing of this determinant is also the condition that the points (a, b), (c, d), (e, f) are colinear.

Also solved by *G. B. M. ZERR*.

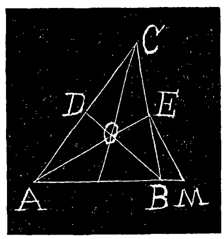
177. Proposed by GEORGE LILLEY, Ph. D., LL. D.. University of Oregon. Eugene. Ore.

If two medians of a triangle intersect each other at right angles, the third median will be the hypotenuse of a right triangle, of which the other two will be the sides.

Solution by H. B. PENHOLLOW. DeWitt Clinton High School, New York. N. Y.

Given $\triangle ABC$, medians meeting at O, having $\angle AOB$ a right angle.

From E draw EM perpendicular to AE, meeting AB produced in M. Then $\triangle AEM$ is a right triangle in which AE is one median, $EM=DB$ another median. Also since triangles AEM and AOB are similar, $AE/AO=AM/AB$. But $AE=\frac{3}{2}AO$.



$\therefore AM=\frac{3}{2}AB$.

Also OF is median of right triangle AOB.

$\therefore OF=\frac{1}{2}AB$, or $CF=\frac{3}{2}AB=AM$. Q. E. D.

Also solved by *P. S. BERG, HENRY HEATON, P. H. PHILBRICK, C. A. LINDEMANN, G. I. HOPKINS, S. E. HARWOOD, J. F. LAWRENCE, T. T. DAVIS, G. B. M. ZERR*, and *ANNA BENCHOTEN*. Professor Penhollow and Miss Benchoten each furnished three solutions.

178. Proposed by JOHN M. ARNOLD. Crompton. R. I.

A cylinder thirty feet long and two feet in diameter is to be placed in a machinery car, the inside dimensions of which are eight feet wide and eight feet high. Find length of the shortest car that will contain it.

No correct solution of this problem has been received.

179. Proposed by ALFRED HUME, C. E., D. Sc.. Professor of Mathematics, University of Mississippi, University of Mississippi.

Of all isosceles triangles inscribed in a circle, the equilateral is the maximum and has the maximum perimeter. Prove geometrically.

Solution by the PROPOSER.

Case I. (See Fig. 1.) Vertical angle of isosceles triangle less than 60°.

Let ABC be an inscribed equilateral triangle and ADE any inscribed isosceles triangle with its base DE parallel to BC.